

Emergency management of acute ischemic stroke in Canadian hospitals

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Abstract

Background: Cerebrovascular disease is diagnosed in 40 000 of the people discharged from hospital each year in Canada. Despite the importance of stroke to our health care system, there is little or no information on its management in Canadian hospitals.

Methods: We examined the management of acute ischemic stroke in a convenience sample of 19 hospitals (selected to represent all regions of Canada and both rural and urban settings). Each hospital was asked to record the management of 20 consecutive patients during 1996 and 1997 with the final diagnosis of acute ischemic stroke on standardized data sheets.

Results: The 19 hospitals submitted 537 reports. There was little or no difference in the way patients in urban and rural settings were transported to hospital. Common symptoms included slurred speech (46.5%), hemiparesis (41.9%) and hemiplegia (34.1%). For both the urban and rural hospitals, the median time between admission to the emergency department and examination was 9.7 hours. Patients in an urban setting were more likely to undergo CT scanning than those in a rural setting (48.5% v. 11.1%). In terms of outcome, there were no consistent differences between patients in urban and rural settings.

Interpretation: This small study offers a preliminary look at the management of acute ischemic stroke in Canadian hospitals. Patients with stroke may not recognize the severity of their symptoms or the need for immediate treatment, as indicated by the relatively low reliance on the 911 emergency services among urban patients. Rural patients were less likely to undergo CT scanning or to have their diagnosis confirmed by a neurologist. In terms of outcome after stroke, current data suggest that there are no significant differences between patients in urban and rural settings.

Résumé

Contexte : On diagnostique une maladie cérébrovasculaire chez 40 000 des personnes qui reçoivent leur congé de l'hôpital chaque année au Canada. Malgré l'importance des accidents cérébrovasculaires (ACV) pour notre système de soins de santé, l'information sur le traitement de ce problème dans les hôpitaux du Canada est très limitée, voire inexistante.

Méthodes : Nous avons examiné le traitement de l'accident ischémique cérébral aigu dans un échantillon de commodité constitué de 19 hôpitaux (choisis pour représenter toutes les régions du Canada et les milieux rural et urbain). On a demandé à chaque hôpital de consigner sur des feuilles de données normalisées, en 1996 et 1997, le traitement de 20 patients consécutifs chez lesquels on avait diagnostiqué un accident ischémique cérébral aigu.

Résultats : Les 19 hôpitaux ont présenté 537 rapports. La façon dont les patients urbains et ruraux ont été transportés à l'hôpital a présenté des différences minimales ou nulles. Les symptômes communs comprenaient un empâtement de la parole (46,5 %), une hémiparésie (41,9 %) et une hémiplégie (34,1 %). Dans les hôpitaux ruraux aussi bien que dans les hôpitaux urbains, la durée médiane de la période écoulée entre l'admission à l'urgence et l'examen a été de 9,7 heures. Les patients urbains étaient plus susceptibles de subir un examen tomodensitométrique que les patients ruraux (48,5 % c. 11,1 %). En ce qui concerne les résultats, on n'a constaté aucune différence uniforme entre les patients urbains et ruraux.

Interprétation : Cette étude restreinte présente un aperçu préliminaire du traitement de l'accident ischémique cérébral aigu dans les hôpitaux du Canada. Il se peut que les patients victimes d'un ACV ne reconnaissent pas la gravité de leurs symptômes ou qu'ils ont besoin d'être traités sur-le-champ, comme l'indique l'utilisation relativement limitée des services d'urgence 911 par les patients urbains. Les patients ruraux étaient moins susceptibles de subir un examen tomodensitométrique ou de faire confirmer leur diagnostic par un neurologue. En ce qui concerne les résultats après l'ACV, les données courantes indiquent qu'il n'y a pas de différences significatives entre les patients urbains et ruraux.

Special Supplement

Supplément spécial

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The hospital emergency department is in a unique position to provide acute care to patients with stroke.¹ The type of care given and the timing of it is critical to the outcome of these patients.²

Cerebrovascular disease is diagnosed in 40 000 of the people discharged from hospital each year in Canada.³ Despite the appreciable burden of stroke on our health care system and the critical importance of acute care for patients with stroke, to date there have been few or no quantitative studies⁴ on the presentation or management of this illness. Such data are essential to provide optimal care.

This preliminary study was conducted to identify the current management of patients with acute ischemic stroke in urban and rural hospitals across Canada. As such, it should be considered a first step in understanding how ischemic stroke is treated in the "front lines" of acute care.

Methods

In 1996 and 1997, the heads of emergency departments of 19 hospitals were contacted by the independent research house Walsh Canada/Maclean Fortier on behalf of Janssen-Ortho Ltd. and asked to participate in this study. All 19 hospitals agreed to participate and 14 emergency departments and 13 wards were enrolled. Hospitals were offered honoraria for their participation and each was responsible for obtaining appropriate ethics approval through its medical board. No identifying data were recorded, and all results were studied and released only in aggregate groupings.

The hospitals were chosen as a convenience sample to represent both urban and rural settings, as defined by location (within or outside a metropolitan area) and size (urban hospitals were defined as having a minimum of 150 beds). All regions of Canada were represented: 5 hospitals were in western Canada, 6 in Ontario, 6 in Quebec and 2 in the Maritimes. All of the urban hospitals had CT scanners, whereas only 3 of the rural ones did.

Participating centres were asked to provide profiles of 20 consecutive patients for whom the final diagnosis at the time of hospital discharge was acute ischemic stroke. Centres could either conduct a retrospective chart review of the last 20 patients who met this criteria (most centres chose this option) or could gather prospective data on the next 20 such patients. All data were entered on standardized forms provided by Walsh Canada/Maclean Fortier.

Since the treatment of ischemic stroke with thrombolytic therapy is time-sensitive, and since there is currently little or no Canadian information on the amount of time from arrival at hospital to first examination by a physician, the data are presented here primarily with respect to the type of hospital (urban and rural).

Results

In total, 537 records were collected: 339 (63.1%) from urban

hospitals and 198 (36.9%) from rural hospitals. The distribution of patients by sex and age was very similar for these 2 groups.

Because patients could report more than 1 symptom, 896 were recorded for the 537 patients. A large proportion of patients reported slurred speech (250/537, 46.5%), hemiparesis (225/537, 41.9%) or hemiplegia (183/537, 34.1%). Fewer patients reported dizziness (89/537, 16.6%), vision problems (80/537, 14.9%) or headache (69/537, 12.8%).

A greater proportion of urban patients than rural patients (152/339, 44.8% v. 46/198, 23.2%) called 911 before presenting at the emergency department. Nevertheless, there was little or no difference between modes of transportation for the urban and rural groups (Table 1).

Table 2 shows the amount of time from admission to the emergency department to examination. For both the urban and rural hospitals, the median time to examination was 9.7 hours. The range was extremely wide; for 10% the time between admission and examination was 2 hours or more. More urban than rural patients were examined within 3 hours of arrival (63.7% v. 43.9%); however, because of the high proportion of cases for which these data were missing (primarily because patients presented to the ward rather than the emergency department) it is difficult to determine whether this trend is significant.

Of the 537 records, 258 (48.0%) were submitted by emergency departments. Of these 258, 211 (81.8%) included data on the amount of time from arrival at the hospital to first contact with a physician. The mean time to first examination was 43 minutes, with 191/258 (74.0%) being examined within 2 hours.

Table 3 shows the type of physician who first examined the patient upon arrival at the emergency department. Although a neurologist was the first contact for only a small group of patients with stroke (< 1%), neurologists did confirm the diagnosis of ischemic stroke for a large proportion of urban patients (38.6%, Table 4). In contrast, only a small group of rural cases

Table 1: Mode of transportation to hospital emergency departments used by victims of stroke

Mode of transportation	No. (and %) of patients by type of hospital		
	Urban <i>n</i> = 339	Rural <i>n</i> = 198	Both <i>n</i> = 537
Ambulance	203 (59.9)	114 (57.6)	317 (59.0)
Car	121 (35.7)	79 (39.9)	200 (37.2)
Unknown	15 (4.4)	5 (2.5)	20 (3.7)

Table 2: Time between arrival at the emergency department to examination

Time	No. (and %) of patients by type of hospital		
	Urban <i>n</i> = 339	Rural <i>n</i> = 198	Both <i>n</i> = 537
< 3 hours	216 (63.7)	87 (43.9)	303 (56.4)
≥ 3 hours	9 (2.6)	0 (0.0)	9 (1.7)
Unknown	114 (33.6)	111 (56.1)	225 (41.9)

were confirmed by a neurologist (8.6%, $p < 0.001$). In rural hospitals, the emergency department staff were responsible for more than half (52.5%) of the confirmations of ischemic stroke.

Of the entire group of 537 patients, 187 (34.8%) underwent a CT scanning. The average time between arrival at the emergency department and CT scanning was 15.1 hours for emergency department patients and 423.9 hours for ward patients. More urban than rural patients underwent CT scanning (48.5% v. 11.1%, $p < 0.001$). The average wait for a CT scan was longer for rural than for urban patients (15.0 hours v. 4.5 hours). The proportion of patients who underwent CT scanning within 3 hours of arriving at the emergency department was 21.2% for urban patients (72/339) and 3.5% for rural patients (7/198).

Hospitals were asked to report the status of each patient at the time of discharge as "minimal disability," "moderate disability," "severe disability" or "death." "Death" was listed for 27 patients (5.0%). The likelihood of death increased with age, as can be seen in Fig. 1. Rural hospitals reported more minimal disabilities than urban hospitals (57.4% v. 43.7%, $p < 0.01$), while urban hospitals reported more moderate disabilities (36.3% v. 18.4%, $p < 0.001$). In the "severe disability" category there was no significant difference between patients at urban and rural hospitals (13.5% v. 16.3%, $p > 0.05$); nor was there a difference in deaths (6.5% v. 7.8%, $p > 0.05$).

Discussion

This preliminary study provides information on the way in

Table 3: Type of physician who first examined patients with stroke upon arrival at the emergency department

Type of physician	No. (and %) of patients by type of hospital		
	Urban <i>n</i> = 339	Rural <i>n</i> = 198	Both <i>n</i> = 537
General practitioner	125 (36.9)	44 (22.2)	169 (31.5)
Emergency department staff	32 (9.4)	141 (71.2)	173 (32.2)
Intern	43 (12.7)	0 (0.0)	43 (8.0)
Resident	119 (35.1)	5 (2.5)	124 (23.1)
Neurologist	4 (1.2)	0 (0.0)	4 (0.7)
Internist	3 (0.9)	4 (2.0)	7 (1.3)
Other	3 (0.9)	3 (1.5)	6 (1.1)
Unknown	10 (2.9)	1 (0.5)	11 (2.0)

Table 4: Type of physician who confirmed the diagnosis of stroke

Type of physician	No. (and %) of patients by type of hospital		
	Urban <i>n</i> = 339	Rural <i>n</i> = 198	Both <i>n</i> = 537
Neurologist	131 (38.6)	17 (8.6)	148 (27.6)
Emergency department staff	85 (25.1)	104 (52.5)	189 (35.2)
Resident	56 (16.5)	3 (1.5)	59 (11.0)
Other	29 (8.5)	46 (23.2)	75 (14.0)
Unknown	38 (11.2)	28 (14.1)	66 (12.3)

which patients with ischemic stroke are managed when they present to hospitals in Canada. Limitations of the study include the small number of hospitals (19) and patients (537), the non-random nature of the sample, the use of data gathered by unblinded parties and the lack of a standard means of defining ischemic stroke (i.e., CT scans were not used to confirm the diagnosis). As well, because many hospitals collected data by retrospective chart review, some types of nonroutine data (e.g., amount of time from presentation to first contact with a physician) were not available. Because of these weaknesses, it is impossible to evaluate how valid, representative or generalizable the results may be for Canadian hospitals.

At the same time, this preliminary study is important because it presents some of the only existing Canadian data, beyond the artificial limits of clinical trials, on patients' presentation at hospital emergency departments for ischemic stroke. Although a "gold standard" for defining stroke would have been useful, it should be noted that the cases were chosen by the participating physicians on the basis of a final diagnosis of acute ischemic stroke.

As the new therapeutic agents such as thrombolytics and neuroprotectives become available for acute stroke, expediency of transportation to hospital and "door-to-treatment" time will become critical because of their narrow therapeutic window of opportunity. Data from this study suggest that the symptoms of stroke may not be recognized by the Canadian public as a medical emergency; among urban patients only 45% used 911. The proportion of rural patients who used 911 was even lower, but this is to be expected given the limited availability of 911 services outside urban centres.

Other data support the view that the public has a poor understanding of the seriousness of the warning signs of stroke. A recent American study⁴ found that only 24% of patients with stroke arrived within 3 hours of the onset of symptoms. Among those who arrived later, 86% reported that they had not realized their symptoms were serious. Although 38% of all stroke

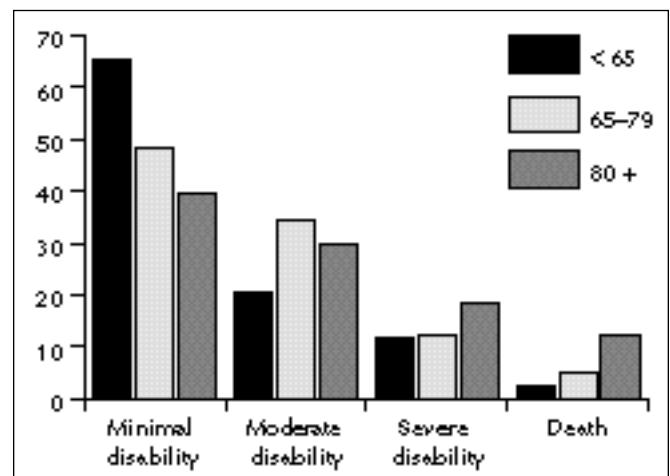


Fig. 1: Status of patients with stroke (severity of disability or death) on release from hospital, by age group

patients interviewed at the tertiary care centre in that study claimed to know the warning signs of stroke, only 25% had correctly interpreted their symptoms.

In our study, 60% of patients arrived at hospital emergency departments by ambulance. However, it is not known whether these were considered urgent transports. According to the Heart and Stroke Foundation, some emergency service providers have indicated that stroke is not considered a high-priority, high-urgency condition (i.e., lights and sirens may not be activated). Thus, the time from onset of symptoms to arrival at hospital may be longer than what would be considered acceptable for other conditions such as acute myocardial infarction or trauma.

The average time between admission and first contact with a physician was the same in urban and rural settings (43 minutes). This is approximately 50% longer than the time reported by Bratina and colleagues⁵ for a tertiary care centre in Houston, where the mean time was 28 minutes. In the Houston study, the amount of time to physician contact was significantly shorter for patients who arrived by ambulance than for those who arrived by car (20 v. 48 minutes).

Only 3 of the 10 rural hospitals in our sample had CT scanners, which likely accounts for the lower proportion of rural patients who underwent CT scanning and the longer waiting times. (It should be noted that timely access to CT is a prerequisite for the use of thrombolytic therapy for ischemic stroke.)

With respect to outcome of patients with stroke, this preliminary study produced inconsistent findings regarding the proportion of patients who were categorized as having "minimal," "moderate" or "severe" disability when discharged. These inconsistencies may be the result of several factors: the small amount of data (data on status at discharge were available for only 72.0% of patients); bias in the transportation of patients (i.e., more serious cases may have been rerouted from

rural hospitals to urban centres); differences in the qualitative definitions of "minimal," "moderate" and "severe" disability; and bias in the gathering of data (e.g., failure to record deaths). More research needs to be done before it can be determined whether there are differences in outcome between patients with ischemic stroke who present to urban hospitals and those who present to rural hospitals.

Patients admitted to rural hospitals are less likely to call 911 before arriving at hospital, are less likely to have CT scanning and are less likely to have their diagnosis confirmed by a neurologist. All of these differences can be attributed to the lack of resources available in most rural settings. Despite these differences, there appear to be few significant differences between urban and rural hospitals in terms of the outcome of patients with stroke. More systematic, rigorous research needs to be conducted to give a full and accurate picture of emergency treatment of stroke in Canada.

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